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**Direct drive for one cylinder of a printing press****Field of the Invention**

5 The invention relates to an electromotive direct drive for one cylinder of a printing press, which cylinder is held in a connecting construction with a journal via a roller bearing, a rotor of an electric motor being connected fixedly in terms of rotation to the journal,  
10 and a stator being connected to the connecting construction.

**Background of the Invention**

15 In the past, printing units of printing presses have been driven by a main drive which distributes its drive power to the individual units of a printing press via a mechanical line shaft. The printing units are connected and coupled to one another by said mechanical line  
20 shaft in such a way that their synchronized running with respect to one another is also possible. In order to realize this, however, a complex mechanical system is necessary with a large number of different components such as gear mechanisms and clutches. The  
25 weak points which result from this, such as transmission errors on account of yielding of mechanical transmission members, play, elasticity and additional large inertial masses, impair the printed image, however.

30 Attempts have been made to eliminate this deficiency by a separate, electromotive drive being assigned to every printing unit or its cylinder. A separate printing drive of this type, which is also called a direct  
35 drive, for one cylinder of a printing press is already known from DE 41 38 479 C3. Said drive makes it possible that a drive train which is free of play, low in inertial mass and mechanically rigid can be

constructed for every cylinder or every roll of a printing unit. The masses which are to be moved are connected rigidly and fixedly to the rotor of the driving electric motor directly, with the preclusion of  
5 elasticity, yielding and play, the associated stator likewise being connected to a stationary wall, for example a printing press wall, in a manner which is free of elasticity and play. As can be gathered from figure 7 of this prior publication, a cylinder of a  
10 printing unit is provided at one end side with a journal of reduced diameter. At its end which faces the cylinder, said journal is held by a roller bearing. A rotor of an electric motor is pushed onto the journal in a manner which is spaced apart from said roller  
15 bearing, the associated stator of said electric motor being held by an adjustment wall of the printing press. A disadvantage of this arrangement is that it requires relatively high expenditure on assembly, because the bearing which holds the journal and the driving  
20 electric motor do not form a unit which is ready for installation.

This form of direct drive is also known from EP 1 277 575 A1. As shown by the associated figures 31, 32 and  
25 33 of this prior publication, the journal of a cylinder of a printing press is held in a housing via a bearing point. In turn, this bearing point is adjoined by an electric motor, the rotor of which is pushed onto the journal and the stator of which is accommodated by a  
30 housing which is connected to a frame wall. The abovedescribed disadvantages are also apparent here, that is to say the electric motor of the direct drive and the associated bearing of the journal do not form a unit which is ready for installation.

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#### **Summary of the Invention**

Proceeding from the disadvantages of the prior art, the invention is based on the object of developing an electromotive direct drive for cylinders of a printing press in such a way that said direct drive is  
5 configured for handling which is amenable to assembly, that is to say easy.

According to the invention, this object is achieved according to the characterizing part of claim 1 in  
10 conjunction with its precharacterizing clause, by the rotor being connected to an end side of the roller bearing, and the stator being accommodated by a housing which can be fastened to the connecting construction via a bearing housing.

15 The decisive advantage of the direct drive which is configured according to the invention lies in the fact that a captive structural unit which combines the electric motor and the bearing is formed, which  
20 structural unit can be attached by the end user in a simple manner merely by fastening it into its connecting construction. This is advantageous, in particular, as the rotor and the stator of the electric motor cannot change their operating position with  
25 respect to one another as a result of the configuration according to the invention, because they are connected fixedly to other constituent parts of the structural unit. This is of significance as great forces can occur between the two on account of permanent magnets. The  
30 other advantages which are known per se of a direct drive for driving one cylinder of a printing press are preserved. Therefore, a drive train which is free of play, low in inertial mass and mechanically rigid can be constructed for every cylinder or for every press  
35 roll, which drive train is additionally combined to form a captive structural unit. In this way, the printing quality can be improved, as the masses which are to be moved are connected rigidly and fixedly to

the rotor of the driving electric motor directly, with the preclusion of elasticity, yielding and play. There is no need at this point to address further advantages of direct drives in printing presses, as they are known  
5 to the person skilled in the art and are also shown in detail, for example, in DE 41 38 479 C3.

Further advantageous refinements of the invention are described in subclaims 2 to 9.

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In one development of the invention, there is provision as claimed in claim 2 for the bearing housing to be held concentrically by a an accommodation hole of the connecting construction. This has the advantage that  
15 installation space can thus be saved in the axial direction.

According to a further additional feature in accordance with claim 3, the rotor is to cover an end side of the  
20 journal at least partially in the radially inward direction. It is ensured in this way that the structural unit which comprises the electric motor and the bearing can be fastened to the journal of the cylinder in a simple manner.

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According to a further additional feature in accordance with claim 4, the roller bearing is to be configured as a cylindrical roller bearing, a tapered roller bearing or an angular contact ball bearing.

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There is provision as claimed in claim 5 for an outer raceway of the roller bearing to be formed by an outer ring or by the bearing housing itself. In the latter case, the structural unit is reduced by one constituent  
35 part, with the result that said structural unit is designed even more simply.

It is apparent from claim 6 that the outer raceway of the roller bearing is offset eccentrically with respect to an axis of the receptacle hole of the connecting construction. It is possible in this way for the  
5 rotational axis of the cylinder to be adjustable, in that the outer raceway of the roller bearing can be deflected eccentrically within the connecting construction. The cylinder can thus be adjusted or positioned with respect to a further cylinder by  
10 rotation of the complete unit.

In one advantageous development of the invention as claimed in claim 7, a measuring apparatus for determining the rotational angle of the cylinder is to  
15 be arranged on said cylinder for achieving synchronism with other cylinders of the printing press. In the context of the invention, this is to be understood as a fixed direct connection between the cylinder and the measuring apparatus, which connection avoids measuring  
20 errors of previous systems which are connected to the cylinder via coupling elements.

It is apparent from claim 8 that a sensor is arranged in the bearing housing, which sensor is operatively  
25 connected to an encoded measuring ring which is arranged on the journal of the cylinder, the sensor signals which are detected being supplied to a control device for adjusting advanced or retarded running.

30 In this way, precise synchronism of a plurality of cylinders of a printing press can be achieved, as corrections to the advanced or retarded running of individual cylinders can be performed by the control device in a simple manner. Regulating systems of this  
35 type in the printing industry are already known per se and have already been described, for example, in DE 43 22 744 C2, DE 197 14 402 A1, DE 197 16 943 A1 and DE 197 54 323 A1. In the context of the invention, the

advantage lies in the fact that this regulating device which is known per se for setting the synchronism of a plurality of cylinders is an inherent constituent part of the structural unit according to the invention.

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Finally, there is provision as claimed in claim 9 for the measuring ring to be a separate component or to be formed by an axial extension of an inner ring of the roller bearing.

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The invention will be described in greater detail using the following exemplary embodiment.

### **Brief Description of the Drawings**

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In the drawings:

figure 1 shows a longitudinal section through a direct drive according to the invention of one cylinder of a printing press, and

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figure 2 shows a perspective illustration of the direct drive according to figure 1, in a partially sectioned view.

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### **Detailed Description of the Drawings**

The electromotive direct drive which is shown in figures 1 and 2 for a printing press exhibits a cylinder 1 which is continued at one end by a journal 2 of reduced diameter. Said journal 2 is held via a roller bearing 4 in a connecting construction 3, for example a frame wall. Said roller bearing 4 is configured as a double-row floating cylindrical roller bearing which is pretensioned without play, and has an outer ring 4.1 and an inner ring 4.2, between which cylindrical rollers 4.4 which are guided in cages 4.3 roll on associated raceways. The bearing 4 is held

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concentrically by a bearing housing 5, the bearing housing 5 in turn being held concentrically by the receptacle hole 3.1 of connecting construction 3.

5 A further part of the direct drive is an electric motor 6, the bowl-like rotor 6.1 of which covers the end side of the journal 2 partially in the radial direction and is fixed to said end side with the aid of fastening screws 7. At the same time, the rotor 6.1 is connected  
10 via further fastening screws 8 to the end side of the inner ring 4.2 of the roller bearing 4. The stator 6.2 is accommodated by a housing 9, the base 9.1 of said housing 9, which extends in the radial direction, being continued by an inner and an outer flange 9.2, 9.3  
15 which extend in the direction of the axis 10. The stator 6.2 is fitted fixedly in terms of rotation to the inner flange 9.2 of the housing 9 in any desired manner. The housing 9 is connected via fastening screws 11 to the bearing housing 5, the latter in turn being  
20 surrounded concentrically by the connecting construction 3 and being connected fixedly to the latter via further fastening screws 12. In this way, a structural unit is formed which comprises the roller bearing 4, the bearing housing 5, the rotor 6.1, the  
25 stator 6.2 and the housing 9, and which is held together by the fastening screws 8 and 11. This has the advantage that the rotor 6.1 and the stator 6.2 cannot change their position with respect to one another, that is to say the air gap 6.3 which is formed between the  
30 two is always constant. The assembled structural unit which is stable and adapted to the requirements of a printing press manufacturer is delivered to the latter, who need only introduce it into his construction in a simple manner with the aid of fastening screws 7 and  
35 12.

As can be seen further from the abovementioned figures, a measuring system is also part of the direct drive, it

being possible to sense the rotational angles of the cylinder 1 with the aid of said measuring system. Said measuring system comprises a sensor 13 which is operatively connected to an encoded measuring ring 14.

5 The sensor 13 is held by a receptacle hole of an extension 5.1 of the bearing housing 5 and is arranged spaced apart in the radial direction from the measuring ring 14, the latter being positioned on the journal 2 next to the bearing inner ring 4.2. The encoding marks

10 of the measuring ring 14, which are spaced apart from one another uniformly in the circumferential direction, are scanned by the sensor 13, and the sensor signals are supplied to a control device, for example a microcomputer, which determines the corresponding

15 rotational angles of the cylinder 1. Said rotational angles of the cylinder 1 are then compared with rotational angles of other cylinders of the printing press and corrected in such a way that the rotational speed is maintained, increased or decreased. In this

20 way, synchronous running of a plurality of cylinders of a printing press can be realized in a simple manner. The advantage of this measuring arrangement lies in the fact that it is an inherent constituent part of the assembled direct drive unit. Complicated measuring

25 arrangements which have to be attached from outside can therefore be dispensed with. Possible sources of faults are also precluded by the integration of the measuring arrangement into the direct drive unit.



**List of designations**

- 1     Cylinder
- 2     Journal
- 3     Connecting construction
- 3.1   Accommodation hole
- 4     Roller bearing
- 4.1   Outer ring
- 4.2   Inner ring
- 4.3   Cage
- 4.4   Cylindrical roller
- 5     Bearing housing
- 5.1   Extension
- 6     Electric motor
- 6.1   Rotor
- 6.2   Stator
- 6.3   Air gap
- 7     Fastening screw
- 8     Fastening screw
- 9     Housing
- 9.1   Base
- 9.2   Inner flange
- 9.3   Outer flange
- 10    Axis
- 11    Fastening screw
- 12    Fastening screw
- 13    Sensor
- 14    Measuring ring